

14 Demersal elasmobranchs in the Norwegian Sea

14.1 Ecoregion and stock boundaries

The Norwegian Sea connects with the Northeast Atlantic Ocean to the southwest, the Icelandic Waters ecoregion and Greenland Sea to the west along the edge to the shallower Iceland Sea between the Faroe Islands, and northwards to Jan Mayen. To the south it borders to the shallower North Sea along the 62°N parallel between Norway and the Faroe Islands, and to the northeast with the shallower Barents Sea (ICES 2019). It comprises ICES Divisions 2.a-b.

The occurrence of chondrichthyan species in the Norwegian Sea ecoregion was reviewed by Lynghammar *et al.* (2013). In coastal areas, thorny skate *Amblyraja radiata* is the most abundant skate species (Williams *et al.*, 2008). While more abundant in the north, this species is common at all latitudes along the Norwegian coast.

Other species that have been confirmed in the coastal area are thornback ray *Raja clavata*, common skate complex (most likely flapper skate *Dipturus intermedius* (Lynghammar *et al.*, 2014; C. Junge, pers. obs.), sailray *Rajella lintea*, Norwegian skate *Dipturus nidarosiensis*, sandy ray *Leucoraja circularis*, shagreen ray *Leucoraja fullonica*, round skate *Rajella fyllae*, arctic skate *Amblyraja hyperborea* and spinytail skate *Bathyraja spinicauda*. Long-nose skate *Dipturus oxyrinchus* is distributed mainly along the southern section of the coastline, south of latitude 65°N. Records of blond ray *R. brachyura* and spotted ray *R. montagui* need to be confirmed by voucher specimens, although they are present in catch statistics (Lynghammar *et al.*, 2014).

In deeper areas of the Norwegian Sea, *A. radiata* and *A. hyperborea* are the two most abundant species, but *B. spinicauda* and *R. fyllae* also occur regularly, particularly north of 70°N (Skjaeraasen and Bergstad, 2001; Vollen, 2009 WD).

Sharks in the Norwegian Sea ecoregion include spurdog *Squalus acanthias* (Section 2) velvet belly lanternshark *Etmopterus spinax* (Section 5), porbeagle *Lamna nasus* (Section 6), basking shark *Cetorhinus maximus* (Section 7), Greenland shark *Somniosus microcephalus* (Section 24), black-mouth catshark *Galeus melastomus* and lesser-spotted dogfish *Scyliorhinus canicula* (Section 25). One chimaera, the rabbitfish *Chimaera monstrosa* is also found in the Norwegian Sea.

Stock boundaries of skates and rays in the Norwegian Sea are not known, neither are the potential movements of species between the coastal and offshore areas. Further investigations are necessary to determine potential migrations or interactions of elasmobranch populations within this ecoregion and adjacent areas.

14.2 The fishery

14.2.1 History of the fishery

There are no fisheries targeting skates or sharks in the Norwegian Sea, though they are caught in various demersal fisheries targeting teleost species. All skate species in the ecoregion may be taken as bycatch, with only larger individuals thought to be landed (see Section 14.3).

14.2.2 The fishery in 2020

No new information.

14.2.3 ICES advice applicable

ICES does not provide advice for the skate stocks in this ecoregion, although some stocks of North Sea skates may extend into the southern parts of the Norwegian Sea.

14.2.4 Management applicable

There are no TACs for any of the skate stocks in this ecoregion.

Norway has a general ban on discarding. Since 2010, all dead or dying skates in the catches should be landed, whereas live specimens can be discarded.

14.3 Catch data

14.3.1 Landings

Landings data for skates are provided for the years 1973–2020 (Table 14.1). For ICES Subarea 2, landings data are limited and, for skates, aggregated across all species. This Subarea covers all of the Norwegian Sea ecoregion, but also includes the most westerly parts of the Barents Sea ecoregion (Section 13).

Overall landings throughout time have been low, ca. 200–330 t per year for all fishing countries, with moderate fluctuations. The peak in the late 1980s resulted from Russian fisheries landing over 1900 t of skates in 1987, subsequently dropping to low levels two years later. This peak was a consequence of an experimental fishery, when skate bycatch was landed, whereas normally they are discarded (Dolgov, pers. comm.). Russia and Norway are the main countries landing skates from the Norwegian Sea and Figure 14.1 shows their landings from 1973 to 2020.

Landings data (usually not discriminated at species level) since 2010 have been provided by Norway (2010–2020), France (2010–2013), Germany (2010, 2013–2020), the UK (2010–2011, 2013, 2015–2016), Spain (2010, 2012–2014) and the Netherlands (2015). Russian landings have not been available since 2010.

Based on data from the Norwegian Reference fleets, and the expert judgement detailed in Albert *et al.* (2016 WD), Norwegian landings by species and species groups from ICES Subarea 2 were estimated (Table 14.2). The main species landed tend to be larger specimens of *Dipturus oxyrinchus*, *Bathyraja spinicauda* and *Raja clavata*.

14.3.2 Discard data

Based on interviews of the Norwegian Reference Fleet and landing sites, the expected discards of skates varies extensively between species and is assumed almost 100% for specimens below 50 cm. For *Rajella fyllae* and *Amblyraja radiata*, nearly all specimens are probably discarded, whereas the discarding of *Raja clavata* by the coastal fleet is expected to be negligible (Albert *et al.*, 2016 WD).

14.3.3 Quality of catch data

Catch data are not species disaggregated.

Recent data on skate catch and landings in the Norwegian Sea are almost exclusively from Norway, and species information from the Norwegian Reference Fleet (Table 14.2) may be indicative of the total catch and landings. The estimation of total skate catches and landings by species

relied on some strong assumptions, e.g. that data from the Coastal and Oceanic Reference Fleets operating in the Norwegian Sea are representative for vessels below and above 21 m respectively, and that the relative species composition of skate catches in either of these two reference fleets has been stable over the last ten years. These assumptions were made due to limited availability of data. With increased data and extended time series, these assumptions should be relaxed by including running averages over shorter time periods, e.g. 3–5 years.

Even after allocating skate landings to species based on data from the Reference Fleet, the generic “Skates and rays” category still accounted for about 30% of the total skate landings. A further reduction of this proportion should however be achievable. The work on improving species identification by arranging workshops for reference fleet crew and education during visits at sea will continue to further improve data quality in the future.

In addition, the splitting by species should also be validated by independent surveys. The best way to do this is probably to include skates on the list of species sampled from selected landing ports. Skates are mostly landed as wings in Norway, which can make conventional species identification more difficult (although skate identification could be confirmed with genetic barcoding). Programmes for market sampling of skate landings could usefully be undertaken.

14.3.4 Discard survival

No data available to WGEF for the fisheries in this ecoregion.

14.4 Commercial catch composition

14.4.1 Species and size composition

In 2009, Russian landings of skates were taken as bycatch during the longline and trawl demersal fisheries at depths ranging from 50–900 m deep in February–November. The main skate caught was *A. radiata*, with *A. fyllae*, *A. hyperborea* and *B. spinicauda* found in minor quantities (Vinnichenko *et al.*, 2010 WD).

A. radiata (27–58 cm L_T) were recorded in the commercial bottom-trawl catches, comprising mostly males of 41–55 cm and females of 36–50 cm (Figure 14.2a). The proportion of small individuals was lower than in the Barents Sea. The mean length of females (43.7 cm) was smaller than that of males (45.0 cm). Males were slightly more abundant in catches (sex ratio of 1.1:1).

Vinnichenko *et al.* (2010 WD) presented data on *A. radiata* compiled from samples taken by scientific observers on commercial fishing vessels, the Russian survey and the joint Russian–Norwegian surveys. These are presented in Section 14.6.4.

14.4.2 Quality of the data

Information on the species composition of commercial catches is required.

Data from the Norwegian Reference Fleet demonstrated that elasmobranch catches in ICES Subarea 2 were dominated by *A. radiata* and *R. clavata* (Table 14.2; Vollen, 2010 WD), although misidentification problems may exist. For vessels in the Oceanic Reference Fleet, elasmobranch bycatch differed between bottom trawl, bottom gillnet and longline. Whereas *A. radiata* made up the bulk of trawl and longline catches (55% and 79% by numbers, respectively), *R. clavata* dominated in gillnet catches (82%). This was probably influenced by the dominance of trawl and longline vessels further north, and more southerly fishing grounds for gillnetters, but potential misidentifications issues should also be investigated. Catches of *A. radiata* were higher in Subarea 2

than in Subarea 1 for trawl catches (61 kg per 100 trawl hours for Subarea 2; 43 kg per 100 trawl hours for Subarea 1), but lower for longline catches (119 kg per 10 000 hooks vs. 135 kg per 10 000 hooks, respectively).

Data from the Coastal Reference Fleet indicated that the common skate complex (most likely misidentified) and unidentified skates dominated the landed catches in this area (39% and 33% by weight, respectively). Discards were dominated by unidentified skates (32% by weight). As opposed to the Oceanic Reference Fleet, *A. radiata* was only sporadically recorded in this area.

14.5 Commercial catch and effort data

Limited data available (but see above).

14.6 Fishery-independent surveys

14.6.1 Russian bottom trawl survey (RU-BTr-Q4)

Vinnichenko *et al.* (2010 WD) reported that catches from the 2009 survey were dominated by *A. radiata* (10–56 cm L_T; Figure 14.2b). In the size distribution, different size/age classes of the skate were very distinct. The mean length of males (37.7 cm) and females (37.4 cm) were similar, and males predominated slightly (sex ratio = 1.05:1).

A. hyperborea (17–91 cm L_T) were recorded in the catches (Figure 14.2d; specimens > 131 cm were not considered here as they are thought to be typing errors or species misidentifications). The mean length of males (65.1 cm) and females (65.8 cm) were similar, and mostly males were caught (sex ratio = 5:1).

14.6.2 Norwegian coastal survey (NOcoast-Aco-4Q)

The distribution and diversity of elasmobranchs in northern Norwegian coastal areas, based on survey data from 1992–2005, were summarized by Williams *et al.* (2008). The southern portion of the coastal area studied was incorporated within the Norwegian Sea ecoregion, and the Barents Sea was defined as the border between Norwegian Directorate of Fisheries Statistical Areas 04 and 05 (<https://portal.fiskeridir.no/portal/apps/webappviewer/index.html?id=ea6c536f760548fe9f56e6edcc4825d8>).

Thirteen skate species and four species of shark were recorded from the coastal region (Table 14.3). Regularly occurring skates were *A. radiata*, *A. hyperborea*, common skate complex (most likely *Dipturus intermedius* (Junge/Lynghammar, pers. comm)), *D. nidarosiensis*, *D. oxyrinchus*, *Raja clavata*, *Rajella fyllae*, *L. fullonica*. Occasional or single observations were made of *B. spinicauda*, *R. lintea* and *L. circularis* (also *R. montagui*, *R. brachyura* were nominally recorded, but see Section 14.6.5). Four species of shark were identified: *E. spinax*, *G. melastomus* and *S. acanthias*, as well as one specimen of *S. microcephalus*.

A. radiata appear to fluctuate in both biomass and numbers, but the stock had an increasing trend in 2008–2016 (Knutson *et al.*, 2017 WD). *D. oxyrinchus* also fluctuated in biomass, but only slightly in numbers, indicating variance in size composition of the survey catch between years. However, the overall trends in biomass and numbers were positive. The estimates of biomass and abundance of *R. fyllae* were stable over the time-series (2003–2016) (Knutson *et al.*, 2017 WD).

Although no clear shifts in abundance over time were detected for any species, more robust assessment is necessary to better identify temporal trends in abundances.

14.6.3 Deep stations from multiple Norwegian surveys (NO-GH-Btr-Q3 and others)

Vollen (2009 WD) reported on elasmobranch catches from 3185 deep trawl hauls (400–1400 m) along the continental slope (62–81°N) from the Barents Sea to the Skagerrak. Data were combined from multiple deep-water surveys during the period 2003–2009. Data from the Skagerrak are excluded in this section, whereas parts of the Barents Sea ecoregion are included. Overall, nine species (six skates and three sharks) were recorded. *A. radiata* and *A. hyperborea* were the dominant species north of 62°N (ICES Subarea 2), whereas *E. spinax* was most numerous in the Norwegian Deep (Division 3.a). *B. spinicauda* and *R. fyllae* also occurred frequently in the catches in all areas. Reports of *R. clavata* were considered to be misidentifications of other species. Results were reported in more detail in ICES (2009).

14.6.4 Joint Russian-Norwegian survey (BS-NoRu-Q1 (BTr), Eco-NoRu-Q3 (Aco)/Eco-NoRu-Q3 (Btr))

Two joint Russian–Norwegian surveys are conducted in the Barents Sea: one during February (BS-NoRu-Q1 (BTr)), in the southern Barents Sea northwards to the latitude of Bear Island, and another in August–September (Eco-NoRu-Q3 (Aco)/Eco-NoRu-Q3 (Btr)), covering much of the Barents Sea, including waters near Spitsbergen and Franz Josef Land. The Norwegian part of the February survey started in 1981, but data on elasmobranchs are missing for some years. The August–September survey started in 2003. All skates are recorded during these surveys, and data on length distributions as well as some biological data (on board of Russian vessels) are collected. As a result of initial problems with species identification, species-specific data should only be used from the years 2006–2007 onwards (for Norwegian data). Analyses of data from these surveys are not complete, but some data from the 2009 surveys were presented by Vinnichenko *et al.* (2010 WD).

A. radiata was the dominant species in the August–September survey. The length range was 5–61 cm total length (TL), with most specimens in the range 33–37 cm (Figure 14.2c; Vinnichenko *et al.*, 2010 WD).

Vinnichenko *et al.* (2010 WD) also presented data on *A. radiata* compiled for samples collected by scientific observers on commercial fishing vessels, the Russian survey and the joint Russian–Norwegian surveys. Males prevailed in the samples (1.7:1). Most males and females (over 70%) were immature, the rest were in developing stages or were mature. Unlike in the Barents Sea, no individuals at the active stage were reported in the area. The main prey (by weight) were crustaceans (spider crab *Hyas* spp.: 33%; northern shrimp *Pandalus borealis*: 14%; amphipods: 6%), fish (capelin *Mallotus villosus*: 14%; Atlantic hookear sculpin *Artediellus atlanticus*: 12%; unidentified fish remains: 6%) and polychaete worms.

14.6.5 Quality of survey data

The difficulties associated in identifying skate species are a concern when considering the validity of the data used for any assessment. Identification problems between *A. radiata* and *R. clavata* were highlighted by Williams (2007) and summarized in ICES (2007). Despite sampling since 2007, Lynghammar *et al.* (2014) did not catch any specimens of common blue skate *Dipturus batis*, *R. brachyura* or *R. montagui* in the Norwegian Sea: giving more credence to suspected misidentification in earlier year. *D. intermedius* may occur in small numbers in the Norwegian Sea. Indeed, the record of *R. montagui* from central Norway was known from a museum specimen, but

Lynghammar *et al.* (2014) identified it as *R. clavata*. There were also no contemporary records of *L. fullonica*, though this species was reported in historical accounts.

In order to achieve a better quality of survey data, it is important to improve the identification practices, using appropriate identification literature. Ongoing work to improve sampling at the Institute of Marine Research includes workshops to educate staff as well as improved guides and keys used for species identification, including a new simplified guide for commercial longliners since Jan 2021. A workshop series in 2019 established the basis for an updated complete identification guide to be used for surveys and by the reference fleet.

14.7 Life-history information

Some length data are available for *A. radiata* and *A. hyperborea* (Vinnichenko *et al.*, 2010 WD; ICES, 2010). Some biological information is available in the literature (e.g. Berestovskii, 1994). Sampling of elasmobranch egg-cases was included in Norwegian trawl surveys from mid-2009 until 2020 (from 2021: egg cases are still recorded but only sampled when caught in large numbers per station), which may provide future information on nursery grounds.

14.8 Exploratory assessment models

No exploratory assessments have been conducted, due to the limited data available. Analyses of survey trends may allow evaluation of the status of more frequently caught species, although taxonomic irregularities need to be addressed first.

14.9 Stock assessment

No assessments have been conducted.

14.10 Quality of assessments

No assessments have been conducted.

14.11 Reference points

No reference points have been proposed for any of these skate stocks.

14.12 Conservation considerations

The International Union for Conservation of Nature and Natural Resources (IUCN Red List of Threatened species (IUCN, 2014) listings for species occurring in this area include (assessment year in parentheses):

- “Critically endangered”: common skate complex (2006; Europe: 2015) – this complex comprises *Dipturus batis* and *Dipturus intermedius* but their status has not been assessed on a species level yet;
- “Endangered”: *L. circularis* (2014);
- “Vulnerable”: *L. fullonica* (2014);
- “Near threatened”: *B. spinicauda* (2006), *D. nidarosiensis* (2014), *D. oxyrinchus* (2014) and *R. clavata* (2005; Europe: 2014).

Demersal elasmobranchs listed on the Norwegian Red List (Nedreaas *et al.*, 2015), excluding species assessed as “Least concern”, is only the common skate complex (“Critically endangered”).

14.13 Management considerations

There are no TACs for any of the skates in this ecoregion. The demersal elasmobranch fauna of the Norwegian Sea comprises several species that also occur in the Barents Sea (Section 13) and/or the North Sea (Section 15). Further investigations are required and could also offer valuable additional information for managing the neighbouring ecoregions.

14.14 References

- Albert, O.T., Vollen, T., Bjelland, O., Otterå, H., and Nedreaas, K.H., 2016. Norwegian catches and landings of skates by species. Working document for the ICES Elasmobranch Working Group (WGEF) 2016.
- Berestovskii, E. G. 1994. Reproductive biology of skates of the family Rajidae in the seas of the far north. *Journal of Ichthyology*, 34: 26–37.
- ICES. 2007. Report of the Working Group Elasmobranch Fishes (WGEF), 22–28 June 2007, Galway, Ireland. ICES CM 2007/ACFM:27. 318 pp.
- ICES. 2009. Report of the Joint Meeting between ICES Working Group on Elasmobranch Fishes (WGEF) and ICCAT Shark Subgroup, 22–29 June 2009, Copenhagen, Denmark. ICES CM 2009/ACOM:16. 424 pp.
- ICES. 2010. Report of the Working Group on Elasmobranch Fishes (WGEF), 22–29 June 2010, Horta, Portugal. ICES CM 2010/ACOM:19. 558 pp.
- ICES. 2019. ICES Fisheries Overviews: Norwegian Sea ecoregion. Advice. <https://doi.org/10.17895/ices.advice.5707>
- IUCN. 2017. IUCN Red List of Threatened Species. Version 2017.3. <http://www.iucnredlist.org>. Downloaded on 26 June 2018.
- Knutsen, M., Thangstad, T. H., Søvik, G. and Albert, O.T. 2017. Survey trends of skates in Norwegian waters. Working document for the ICES Elasmobranch Working Group (WGEF) 2017.
- Lynghammar, A., Christiansen, J. S., Mecklenburg, C. W., Karamushko, O. V., Møller, P. R. and Gallucci, V. F. 2013. Species richness and distribution of chondrichthyan fishes in the Arctic Ocean and adjacent seas. *Biodiversity*, 14(1): 57–66.
- Lynghammar, A., Christiansen, J. S., Griffiths, A. M., Fevolden, S-E., Hop, H. and Bakken, T. 2014. DNA barcoding of the northern Northeast Atlantic skates (Chondrichthyes, Rajidae), with remarks on the widely distributed starry ray. *Zoologica Scripta*, 43: 458–495.
- Nedreaas K, Hesthagen T, Wienerroither R, Brabrand Å, Bergstad OA, Bjelland O, Byrkjedal I, Christiansen JS, Fiske P, Jonsson B og Lynghammar A (2015) Fisker (Myxini, Petromyzontiformes, Chondrichthyes og Osteichthyes). Norsk rødliste for arter 2015. Artsdatabanken www.artsdatabanken.no/Rodliste/Artsgruppene/Fisker. Downloaded 26 June 2018
- Skjaeraasen, J. E. and Bergstad, O. A. 2001. Notes on the distribution and length composition of *Raja linteus*, *R. fyllae*, *R. hyperborea* and *Bathyraja spinicauda* (Pisces: Rajidae) in the deep northeastern North Sea and on the slope of the eastern Norwegian Sea. *ICES Journal of Marine Science*, 58: 21–28.
- Vinnichenko, V. I., Dolgov, A. V., Yurko, A. S., Zhivov, B. D. and Safronov, A. M. 2010. Russian research and fisheries of sharks and skates in the Northeast Atlantic in 2009. Working document for the ICES Elasmobranch Working Group (WGEF) 2010.
- Vollen, T. 2009. Distribution of chondrichthyan species in Norwegian deep-sea waters. Working document for the ICES Elasmobranch Working Group (WGEF) 2009.

- Vollen, T. 2010. The Norwegian Reference Fleet: Catch and discard of elasmobranchs. Working document for the ICES Elasmobranch Working Group (WGEF) 2010.
- Williams, T. 2007. Cartilaginous fishes along the North-Norwegian coast. Distributions and densities with regard to fishing and sea temperature. Master thesis in International Fisheries Management. Norwegian College of Fishery Science. University of Tromsø, 62 pp., <http://www.ub.uit.no/munin/handle/10037/975>.
- Williams, T., Aschan, M. and Helle, K. 2007. Distribution of Chondrichthyan species along the North-Norwegian coast. Working Document for the ICES Elasmobranch Working Group (WGEF) 2007.
- Williams, T., Helle, K. and Aschan, M. 2008. The distribution of chondrichthyans along the north coast of Norway. *ICES Journal of Marine Science*, 65: 1161–1174.

Table 14.1. Demersal elasmobranchs in the Norwegian Sea. Total landings (t) of skates from ICES Subarea 2 (and Division 2.a and 2.b) from 1973–2020. “n.a.” = no data available, “.” = means zero catch, “+” = < 0.5 tonnes. Countries with only occasional catches are not included by country in the landings table: Denmark (1994), Belgium (1 tonne 1975), Sweden (+ in 1975), Netherlands (1979, 2015), Iceland (2001, 2011), Estonia (2002, 2005), and Ireland (2007, 2009). Species included are: *A. radiata*, *D. licha*, *D. pastinaca*, *D. spp.*, *L. circularis*, *L. fullonica*, *L. naevus*, *M. aquila*, *R. brachyura*, *R. clavata*, *R. montagui*, *R. alba*, *T. marmorata*, Rajiformes (indet).

| | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 |
|-----------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Faroe Islands | . | . | . | 5 | 2 | 1 | 1 | . | . | . | . | . | . | 4 |
| France | . | . | 1 | 68 | 61 | 18 | 2 | 1 | 12 | 109 | 2 | 6 | 5 | 11 |
| Germany | + | 1 | 52 | 12 | 59 | 114 | 84 | 85 | 53 | 7 | 2 | 112 | 124 | 102 |
| Norway | 201 | 158 | 89 | 34 | 99 | 82 | 126 | 191 | 137 | 110 | 96 | 150 | 104 | 133 |
| Portugal | . | . | . | 34 | 39 | . | . | . | . | . | . | . | . | . |
| USSR/Russ. Fed. | . | . | . | . | . | 302 | 99 | 39 | . | . | . | 537 | 261 | 1633 |
| Spain | . | . | . | . | . | . | . | . | . | . | 28 | . | 17 | 5 |
| UK – E, W & NI | 65 | 18 | 14 | 20 | 90 | 10 | 6 | 2 | + | + | . | 5 | 1 | 2 |
| UK – Scotland | 2 | 1 | . | + | 1 | + | . | . | . | . | . | . | + | + |
| Other | . | . | 1 | . | . | . | 2 | . | . | . | . | . | . | . |
| Total | 268 | 178 | 157 | 173 | 351 | 527 | 320 | 318 | 202 | 226 | 128 | 810 | 512 | 1890 |
| | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
| Faroe Islands | . | 15 | . | 42 | . | 2 | . | . | . | . | . | . | . | . |
| France | 21 | 42 | 8 | 56 | 11 | 15 | 9 | 7 | 8 | 6 | 8 | 5 | . | 5 |
| Germany | 95 | 76 | 32 | 52 | . | + | . | . | . | . | . | . | . | 2 |
| Norway | 214 | 112 | 148 | 216 | 235 | 135 | 286 | 151 | 239 | 198 | 169 | 214 | 239 | 244 |
| Portugal | . | . | . | . | . | . | 22 | 11 | . | 10 | 28 | 46 | 10 | 6 |
| USSR/Russ. Fed. | 1921 | 1647 | 867 | 208 | n.a. | 181 | 112 | 257 | n.a. | n.a. | 77 | 139 | 247 | 400 |
| Spain | . | 9 | . | . | . | . | . | . | 3 | . | 3 | 15 | 6 | . |
| UK - E, W & NI | 4 | . | 2 | 1 | + | 1 | + | + | 1 | 4 | . | + | 1 | + |
| UK – Scotland | 2 | + | + | + | + | + | + | . | + | + | + | + | 1 | 1 |
| Other | . | . | . | . | . | . | . | + | . | . | . | . | . | . |
| Total | 2257 | 1902 | 1057 | 575 | 246 | 334 | 429 | 426 | 251 | 218 | 285 | 419 | 504 | 658 |

[illegible]

Table 14.2. Demersal elasmobranchs in the Norwegian Sea. Estimated Norwegian landings (tonnes) of skates and rays by species in ICES Subarea 2. Source: Albert *et al.* (2016 WD).

| | 2012 | 2013 | 2014 | 2015 |
|--|------|------|------|------|
| <i>Amblyraja hyperborea</i> | 9 | 11 | 7 | 10 |
| <i>Bathyraja spinicauda</i> | 23 | 28 | 19 | 23 |
| Common skate complex (most likely <i>Dipturus intermedius</i>) | 7 | 9 | 7 | 7 |
| <i>Dipturus oxyrinchus</i> | 23 | 28 | 23 | 20 |
| <i>Leucoraja circularis</i> | 2 | 2 | 2 | 2 |
| <i>Leucoraja fullonica</i> | 1 | 1 | 1 | 1 |
| <i>Raja clavata</i> | 14 | 17 | 14 | 12 |
| <i>Rajella lintea</i> | 6 | 7 | 5 | 6 |
| Rajidae indet. | 36 | 43 | 27 | 32 |
| Total | 121 | 146 | 104 | 112 |

Table 14.3. Catch data (number of individuals per species) for the Norwegian Sea ecoregion from the Annual Autumn Bottom-trawl Surveys of the North Norwegian Coast, from 1992 to 2005. Adapted from Williams *et al.* (2007 WD).

| Species | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | Total catch | Total % of positive samples | Catch rate (No. per survey) |
|--|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-------------|-----------------------------|-----------------------------|
| <i>Amblyraja radiata</i> | 7 | 44 | 23 | 15 | 8 | 41 | 9 | 16 | 9 | 6 | 10 | 10 | 19 | 9 | 226 | 11% | 17.4 |
| <i>Bathyraja spinicauda</i> | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0% | 0.1 |
| <i>Rajella fyllae</i> | 0 | 4 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 5 | 6 | 4 | 0 | 20 | 1% | 1.5 |
| <i>Raja clavata</i> | 0 | 4 | 15 | 1 | 0 | 2 | 3 | 6 | 0 | 0 | 0 | 0 | 2 | 0 | 33 | 2% | 2.5 |
| Common skate complex (most likely <i>Dipturus intermedius</i>) | 0 | 2 | 0 | 1 | 3 | 7 | 7 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 24 | 1% | 1.8 |
| <i>Leucoraja fullonica</i> | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 3 | 9 | 3 | 0 | 0 | 1 | 20 | 1% | 1.5 |
| <i>Leucoraja circularis</i> | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 9 | 5 | 7 | 23 | 1% | 1.8 |
| <i>Raja montagui</i> * | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 1 | 0 | 1 | 0 | 5 | <1% | 0.4 |
| <i>Dipturus oxyrinchus</i> | 0 | 0 | 54 | 3 | 2 | 30 | 2 | 0 | 0 | 1 | 2 | 6 | 4 | 2 | 106 | 5% | 8.2 |
| <i>Dipturus nidarosiensis</i> | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 3 | 1 | 0 | 1 | 0 | 7 | <1% | 0.5 |
| <i>Amblyraja hyperborea</i> | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 1 | 0 | 6 | <1% | 0.5 |
| <i>Raja brachyura</i> * | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | <1% | 0.3 |
| <i>Rajella lintea</i> | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | <1% | 0.1 |
| <i>Galeus melastomus</i> | 0 | 24 | 1883 | 1197 | 105 | 1269 | 189 | 480 | 258 | 812 | 1196 | 275 | 640 | 48 | 8376 | 24% | 644.3 |
| <i>Etmopterus spinax</i> | 0 | 829 | 8453 | 473 | 1061 | 2733 | 584 | 3881 | 1485 | 1401 | 2417 | 785 | 2305 | 1369 | 27 776 | 33% | 2136.6 |
| <i>Squalus acanthias</i> | 0 | 21 | 51 | 26 | 20 | 5 | 106 | 168 | 12 | 68 | 43 | 21 | 104 | 17 | 662 | 8% | 50.9 |
| <i>Somniosus microcephalus</i> | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | <1% | 0.1 |
| Number of samples | 17 | 163 | 106 | 77 | 74 | 96 | 78 | 81 | 76 | 56 | 78 | 65 | 77 | 63 | | | |

*Probably misidentifications, the occurrence of the species in the area has not been confirmed (see Section 14.6.5).

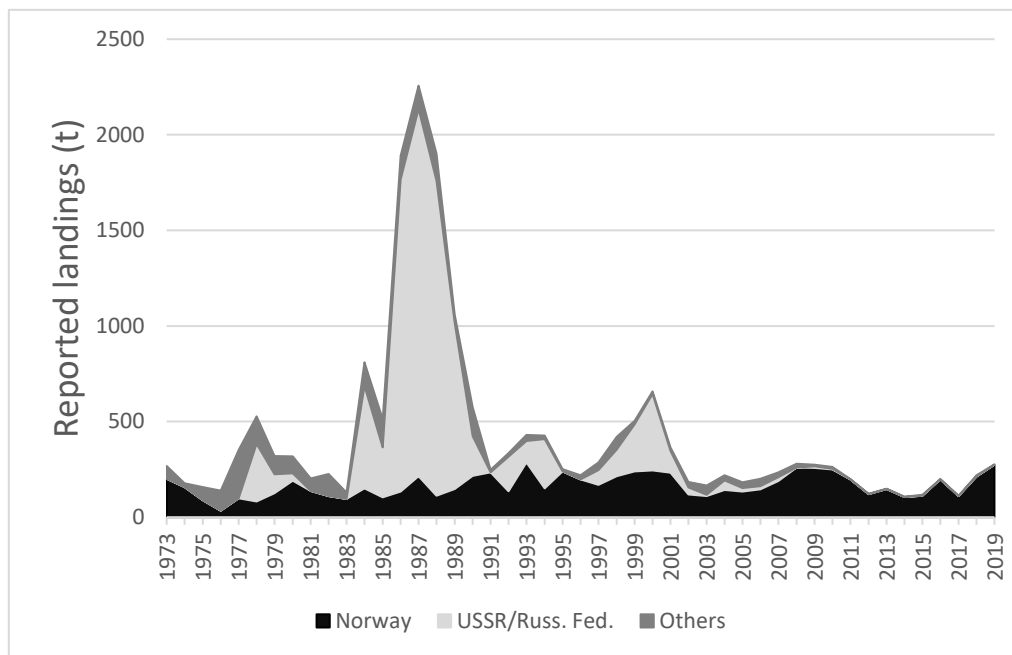


Figure 14.1. Demersal elasmobranchs in the Norwegian Sea. Total landings (t) of skates from ICES Subarea 2 (1973–2019).

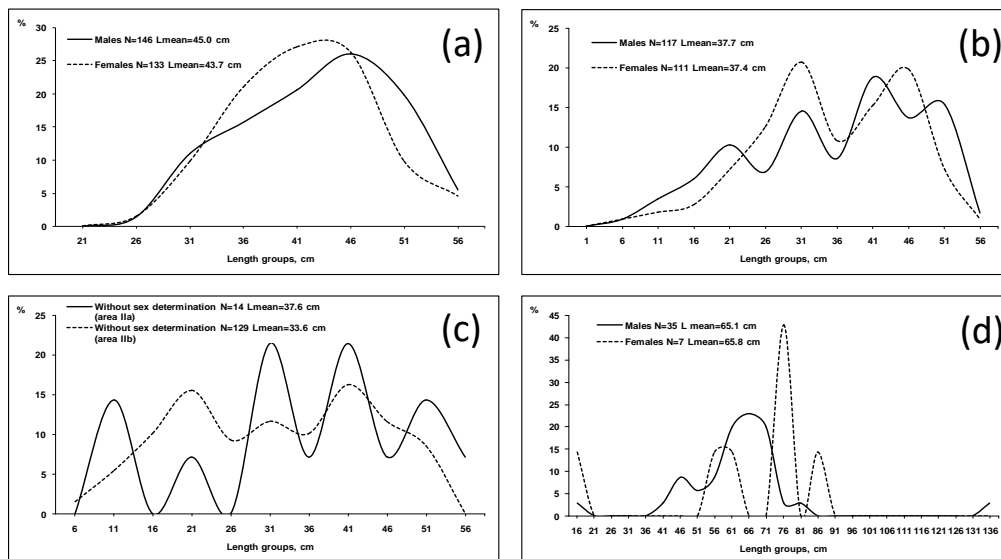


Figure 14.2. Demersal elasmobranchs in the Norwegian Sea showing the length composition of *A. radiata* in (a) commercial bottom-trawl catches in the Norwegian Sea in 2009, (b) Russian demersal survey (October–December 2009) and (c) the Norwegian Sea based on data from the joint Russian–Norwegian ecosystem survey (August–September 2009); and (d) length composition of *A. hyperborea* in the Norwegian Sea (Division 2.b) from the Russian demersal survey (October–December 2009). Specimens exceeding 131 cm are probably typing errors or misidentifications. Source: Vinnichenko *et al.* (2010 WD).